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Evolution or Revolution: Mobility Requirements for the AirLand Battle Future Concept

A Monograph
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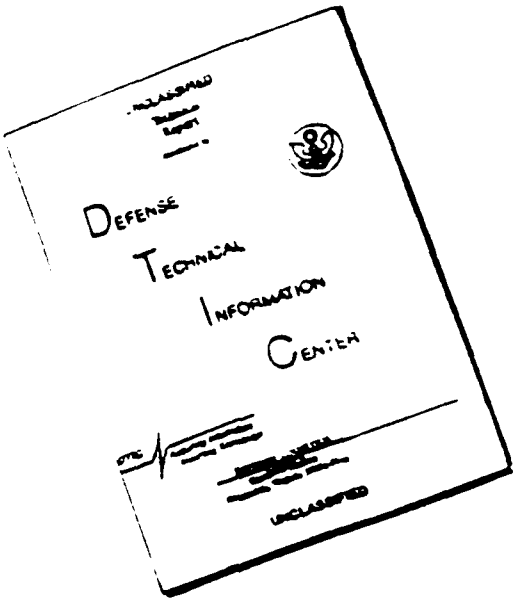

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ABSTRACT

EVOLUTION OR REVOLUTION: MOBILITY REQUIREMENTS FOR THE AIRLAND BATTLE FUTURE CONCEPT by Major Harold L. Chappell, USA, 46 pages.

As the lethality of new weapons technology increases the need for dispersion, the future battlefield will tend toward nonlinearity. The considerations for tactical mobility in the maneuver phase of the ALB-F concept are essential to determining the validity of the concept.

This monograph examines the historical relationship between lethality and dispersion on the battlefield as developed by Jim Schneider in his empty battlefield theory. Using Wass de Czege's Combat Power Model, this monograph develops the relationship of tactical mobility to maneuver and combat power. With this historical analysis and the model a theoretical framework for tactical mobility is established. The considerations for tactical mobility on the future battlefield are examined in the context of the theoretical framework. Finally, using the criteria of sufficiency, feasibility, and the time/space continuum, the critical considerations for tactical mobility in the maneuver phase of the ALB-F concept are developed.

The following conclusion were drawn from this paper. Tactical mobility is an intergal part of maneuver and includes the ability to move over terrain with a dependence on protection, counter- obstacle measures, and sustainment. Technology determines the physical limit of tactical mobility while the moral domain determines the extent to which the physical limit can be realized. Adequate consideration for the tactical mobility of maneuver forces is as vital as the emphasis on long range fires and detection. The development of equipment and organizations which can operate on the nonlinear batlefield envisioned in the maneuver phase of ALB-F will require advances in self-sustainment, obstacle clearing, and protection.

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I. Introduction.

"Mobility is our reserve. Momentum leads to victory.
The quickest way is east.
Attack. Attack. Attack."
Creighton Abrams, LTC, Cav
Commander, 37th Tank Bn
September 1944 (1)

The Army does not want to fight the next war with outdated doctrine. Military leaders are often accused of preparing their forces without proper considerations for changes which have occurred since the last war. Not wanting to get caught fighting the last war, the Army is considering how it will fight in 1995 and beyond. The Airland Battle Future (ALB-F) concept is currently being developed to provide this forward looking analysis and plan of attack for the U. S. Army.

Although a forward looking plan maybe desired, it is impossible to predict the future with complete accuracy. Therefore, the ALB-F concept deserves considerable thought and discussion. Michael Howard contends that no armed forces' doctrine will be entirely correct for the next war and the one who is able to adapt its doctrine most quickly will have the advantage. Yet he adds: "Still it is the task of military science in an age of peace to prevent the doctrines from being too badly wrong."(2) The increasing importance of the first battle for the Army requires that our doctrine is successful. The ALB-F concept must provide the basis for a successful doctrine; therefore, it demands the careful attention of the

Army. The ALB-F concept must be debated with consideration of the theortical and historical significance of the assumptions on which it is based.

While the concept should be examined in this manner, the entire concept is too broad a topic for a single monograph. This monograph examines the critical considerations for tactical mobility in Phase III of the ALB-F concept. In order to provide a basis for discussion, it is necessary to first provide a synopsis of the ALB-F concept.

The ALB-F concept is a significant departure from the current Airland Battle doctrine. It attempts to take advantage of emerging technologies by combining them with a doctrine adapted to changes in the world situation and our national interests. The key point of the concept is the significant increase in intelligence collection and long range target acquisition promised by new technology. These advances will provide near perfect information on the enemy. Using this information, precision long range fires will be the major killers on the future battlefield. These long range fires combined with this near perfect intelligence will interdict the enemy's ability to use force. Our maneuver forces will be initially dispersed out of range of the majority of the enemy's indirect fire systems. They will mass and attack at a critical time and place to deliver the *coup de grace*. The manuever force will then disperse and reconstitute. The ALB-F concept is designed to operate on the nonlinear battlefield. The concept seeks to avoid attrition warfare by using superior firepower and maneuver. (3)

The combat operations are conducted in four overlapping, continuous phases.

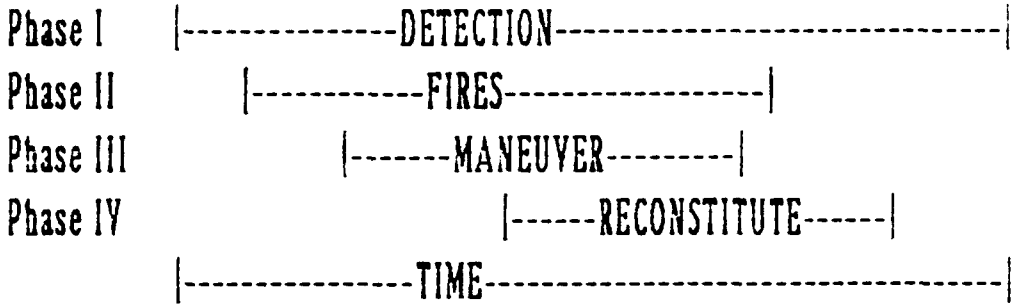
Phase I: Establish the detection area to develop the enemy situation,

refine the expected battle area, and conduct target acquisition. Put out reconnaissance forces.

Phase II: Continue target and situation development and conduct air maneuver and long range air and ground fires to destroy enemy forces throughout the detection and battle area.

Phase III: Continue target and situation development. Continue fires to destroy the enemy while synchronizing air and ground maneuver. Maneuver forces committed, when needed to complete destruction of enemy units.

Phase IV: Forces return to the tactical support area (in defense) or the tactical support area moves forward (in offense). Combat power reconstituted. Prepare for new mission. New detection area restablished.



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The tactical mobility of maneuver forces will be critical to the success of phase III. The tactical focus of ALB-F is to identify the enemy force and destroy it with long range indirect fires. However, the maneuver forces must be available to deliver the *coup de grace* when needed. By remaining at long ranges and dispersed our forces will avoid the enemy's long range fires. Therefore, when committed the maneuver units are required to move quickly along multiple routes over long distances to mass at the critical

time and place. In order to accomplish this, these forces must outmaneuver the enemy while avoiding detection.

It is important to define mobility at this point so that it is not confused with movement or maneuver. FM 5-101 Mobility defines mobility as those activities that enable a force to move personnel and equipment on the battlefield without delay due to terrain or obstacles (5). Maneuver is the movement of forces in relation to the enemy to secure or retain positional advantage(6). Tactical maneuver seeks to set the terms of combat in a battle or engagement. Tactical mobility is the mobility related to tactical maneuver. At the tactical level mobility is related to the structure of the force and the environment of combat. General Creighton Abrams wrote:

> There is some confusion as to just what makes mobility in the ground elements of the Army .... but mobility, if it is to be effective, is made up of a complex balance of factors. The essential factors of mobility are equipment, organization, communictions, command structure, and logistical organization. (7)

For clarity when mobility is used for the remainder of this monograph it will refer to tactical mobility if not otherwise stated.

Using this definition, tactical mobility directly influences tactical maneuver. The ALB-F concept has a revolutionary approach to maneuver. The significance of tactical mobility to this new approach is pivotal. Therefore, a logical first step to validating the maneuver phase of the ALB-F concept is an analysis of it with regards to tactical mobility. This paper examines the critical consideration of tactical mobility and whether the ALB-F concept properly addresses this critical element of phase III.

For this analysis the following methodology will be used. First, the historical relationship between lethality and dispersion is established within the context of how this relationship has influenced the search for tactical mobility. Next, this paper establishes a theoretical framework for mobility using this historical analysis and Wass de Czege's Combat Power Model to show the relationship of mobility to maneuver and combat power, . Then, using this theoretical framework and an examination of predictions on the future battlefield, this paper examines the requirements for mobility on the future battlefield. Finally, the paper uses the criteria of sufficiency, feasibility, and time/space requirements to determine the critical considerations for mobility in ALB-F. Conclusions and implications of this analysis are discussed as they relate to the development of the ALB-F concept.

The development of the ALB-F concept will determine the direction of our Army in weapons developmment and force structure into the 21st century. A critical examination of all its elements is imperative to insure we are prepared for the next war. The quest for mobility on the battlefield has historically been driven by a competition between dispersion to survive and the need to mass for attack. As the lethality of new weapons increases the need for dispersion, the requirement for increased mobility is critical for massing successfully for an attack. The maneuver phase of ALB-F is an attempt to extend this relationship to the battlefield of the future. The ALB-F concept requires superior mobility for our forces. If that mobility is not possible, then a serious flaw in the concept will be identified. Therefore, the significance of this paper is its examination of an essential element of the maneuver phase of the ALB-F concept.

II. Historical Relationship Between Lethality, Dispersion, and Mobility.

"Concentration sums up in itself all the other factors, the entire alphabet of efficiency in war."

Jomini (8)

In his article "The Theory of the Empty Battlefield"(9) James J. Schneider, Professor of Military Theory at the School of Advanced Military Studies, traces the increase in lethality caused by modern firepower to an increase in the need for the soldier to disperse in order to survive. His analysis points out that command and control on the battlefield as well as the intensity of battle is degraded by the required dispersion. Tactical formations are designed to maintain troop control so that superior firepower and mass can be directed toward the enemy. As the rifled musket and then the magazine-fed rifle drove soldiers to entrenchments, massed formations became increasingly unwieldy. Beginning with the American Civil War and the use of railroads, the size and number of separate armies grew as the need for dispersion increased. The problem of how to mass on a dispersed battlefield with available technology spurred military development. The driving factor on the battlefield was mobility of the forces. When armies of equal mobility met on the battlefield, positional warfare was the natural outcome. In positional warfare, attrition is the only viable strategy. The Jominian approach of outmaneuvering your opponent "to strike the decisive blow upon the decisive point" (10) became increasingly more difficult to attain until total deadlock was reached during World War I.

The problem for commanders, which began in the Civil War, was how to overcome the increasing lethality and still mass at the decisive point and

time. The classical flanking movements did not insure a total victory. Envelopment proved unattainable unless overwhelming forces were used. The increased size of the armies combined with the increased lethality and equal mobility made battles of annihilation impossible. The defender could move forces quickly enough to offset initial advantages gained by superior maneuver. With this realization military leaders began the search for superior mobility so that they could outmaneuver their opponent for a decisive victory. In order to mass enough firepower to overcome a determined defensive position, the attacker had to expose his massed forces to fires whose efficiency was increased by the attackers' massing. The attempt to return to maneuver warfare has been the driving force in the development of warfare. Tracing these attempts from the Civil War to the present provides a historical perspective upon which to begin the development of a theoretical framework for the analysis of mobility.

The Civil War brought the beginning of modern warfare. With the introduction of railroads and the telegraph, armies had the ability to concentrate larger numbers and supply them. However, movement away from railheads or ports depended on foot movement and animal power. Edward Hagerman in his book The American Civil War and Origins of Modern Warfare provides great detail as to how the different leaders attempted to provide superior mobility to their army. The amount of baggage allowed and the number of horses, mules, and wagons provided was regulated. The mobility of the soldier depended on how fast he could march or run and how much he could carry on his back. The bulkiness of food and ammunition did not allow the soldier to sustain an attack for more than a few days without support from wagons and pack animals. The principal theoretical adjustment to the increased firepower of the rifled musket in assault tactics

was to increase the speed and mobility of tactical movement ... the new drill introduced double-quick time (165 steps per minute) and the run allowed changes in the order of march to be made in motion rather than after coming to a complete halt." (11) The Union army experimented with the "flying column", a French organization used in Algeria, to increase the army's mobility. It was an attempt to get the soldiers to carry more and reduce the amount of extraneous equipment the soldiers needed.

Once in contact, infantry with rifled muskets in defensive positions combined with traditional smoothbore artillery, drove infantry, artillery, and cavalry from the open field of battle. This firepower reduced the smoothbore artillery to be used mainly in defense. Also, cavalry was forced to dismount and fight as infantry. (12)

Offensive infantry tactics changed in response to the increased lethality of the rifled musket. The first change was the extension of the skirmish order to gain dispersion. Second was the development of assaults by rushes accompanied by hasty entrenchment even during the assault.(13) The classical line and column of the early nineteenth century faded away. The increased lethality forced the Civil War soldier to go to ground on the offense as well as the defense as he searched for a way to protect himself.

As the generals strove for decisive battle, the increased lethality of the rifled musket worked against them. They attempted to overcome the dilemma by increasing the mobility of the army in order to mass superior numbers at the decisive point. However, once battle lines were formed it was foot speed against foot speed. Seldom was the difference significant enough to win a truly decisive victory and trench warfare resulted. Open warfare was only possible where one force so overwhelmingly outnumbered the other that a portion of an army could engage the opponent's army in a positional battle

while the rest of the army moved unopposed, such as Sherman's army after the Battle of Atlanta.

The late nineteenth and early twentieth century continued the trend started during the Civil War. Technology continued to add to the lethality of the battlefield without much improvement in protection for the soldier. Magazine fed rifles, the machine gun, quick firing rifled artillery, and smokeless powder added power to prepared defensive positions which could not be broken by a mass of attacking infantrymen. The lessons of the Boer War and the Russo-Japanese War were lost on the European military leaders prior to World War I. Although predicted by Ivan Block (14), it became painfully clear once the war turned to stalemate on the Western Front that armies of comparable size with equal mobility eventually were doomed to positional warfare.

The lethality of the battlefield dispersed the soldiers and made them dig in. The military leaders tried to break the deadlock and restore mobility for their forces so they could maneuver for the decisive battle. They first tried to overcome it with increased firepower through massive artillery preparations. A weapon of mass destruction, poison gas, was developed. And the first armored vehicles were introduced. However, these technological innovations never proved decisive due to poor utilization and organization. Just as in the Civil War when the lethality forced increased dispersion, the search began for a way to return mobility to the battlefield.

The interwar years were very different than those preceding the First World War. Whereas the military lessons from the Boer and Russo-Japanese War might be overlooked, the carnage and political upheaval of World War I spurred a search for new ideas on the conduct of warfare. The emergence of many theorists during the interwar years provided much thought and

research went into the development of armored forces and air forces. The writings of Guderian, Liddell Hart, Fuller, de Gaulle, Douhet, Tukhachevskiy, and others illustrate just by the shear volume a greater interest in looking for a different way of war. This search was centered on use of mechanized forces and air forces.

The Germans led in the development of armored forces in an attempt to gain decisive maneuver. The key to the German doctrines was superior mobility and firepower for a select strike force which would be followed up by regular foot infantry.(15) The Germans developed a combined arms team which effectively integrated air attacks in the close air support role. By combining firepower and protection in an armored vehicle and using a doctrine which took advantage of this combination, the German Army returned mobility to the battlefield. After the German victories in Poland and France, the Western Armies were convinced of the importance of armored warfare and air power on the battlefield.

While mechanization had increased mobility, it also increased the lethality of the battlefield. With this came even more dispersion to insure survivability.(16) The relationship of lethality and dispersion continued even when mobility increased.

Air power added a new dimension to tactical mobility on the battlefield. The army which had air superiority could deny mobility to their enemy. On 10 June 1944, Field Marshal Erwin Rommel, said that "movement of our troops on the battlefield is completely paralysed while the enemy can maneuver freely."(17) Allied air power in Normandy effectively stopped all German troop movements during daylight.(18). The reduction of the enemy's mobility increased the advantages of our mobility. Airpower added additional lethality thereby forcing increased dispersion. A new type of

aircraft followed which also added to tactical mobility.

This new type of aircraft was the helicopter. Air power could now enhance tactical mobility for our forces as well as reduce the enemy's mobility. During the Korean and Vietnam Wars helicopters were developed to increase tactical mobility. The complete air superiority of the U. S. forces in those wars reduced the mobility of the enemy. During the Vietnam War the helicopter moved soldiers to the battlefield, provided a fire support platform, and delivered logistic support. Although considered a low intensity conflict, the relationship of lethality and dispersion continued as the increased mobility of the helicopter tried to overcome a very dispersed enemy. In another part of the world, more conventional armored warfare continued.

The Arab-Israeli Wars of 1967 and 1973 continued to show that dispersion and lethality needed to be overcome using mobility. Air superiority was even more important in the wide open desert environment. When the Israeli forces were able to maintain air superority, their tank forces held a mobility edge over their Arab enemy.(19) However, the lethality for tanks increased as technology provided a portable weapon system which allowed infantrymen to destroy tanks. The massed use of Saggers by the Egyptians in 1973 attempted to offset the Israeli's advantage in mobile warfare.(20) These wars showed that the intensity of combat and the lethality on the battlefield continues to increase.

This increase in lethality and intensity was reflected in the development of AirLand Battle doctrine.(21) The AirLand Battle doctrine recognizes the linkage between lethality, dispersion, and mobility. In the dynamics of combat power discussion in FM 100-5 Operations, protection links the lethality of the battlefield to the requirement for dispersion:

> Protection is the conservation of the fighting potential of a force so that it can be applied at the decisive time and place. ... all actions that are taken to counter the enemy's firepower and maneuver by making soldiers, systems, and units difficult to locate, strike, and destroy. Among those actions are security, air defense, dispersal, cover camouflage, deception, suppression of enemy weapons, and mobility. (22)

AirLand Battle doctrine recognizes the lethality and dispersal on the current battlefield: "Potential enemies of the United States can be expected to field large quantities of high quality weapons systems whose range and lethality equal or exceed our own."(23) For survival, forces must be dispersed. The AirLand Battle doctrine establishes that to overcome this required dispersal, tactical maneuver is needed to mass combat power: "...effective maneuver is vital to acheiving superior combat power. At all levels, effective maneuver demands air and ground mobility,...."(24) This tactical maneuver is dependent on tactical mobility.

The AirLand Battle doctrine as an umbrella concept seeks to insure that U. S. forces have air and ground mobility through development and procurement of advanced equipment. During the 1980's U. S. forces saw the fielding of the Abrams tank, Bradley fighting vehicle, Apache attack helicopter, Blackhawk helicopter, and many other systems which added to our forces' mobility. Additionally, the fact that the doctrine includes air in the name recognizes the importance to the ground maneuver forces of air support. And certainly air superiority is recognized as vital to insuring mobility as well as protection.

In conclusion, from this brief look at history it appears that there is a definite relationship between lethality, disperaion, and tactical mobility.

Increased lethality on the battlefield leads to increased dispersion for survival. This increased dispersion complicates the ability to mass combat power for offensive action. In order to overcome the requirement for increased dispersion, tactical mobility must be increased. If tactical mobility is restricted, then increased lethality will lead to positional warfare. Having established this historical relationship, it is now necessary to examine how tactical mobility is related to combat power.

III. Relationship of Tactical Mobility to Combat Power.

"Military education hitherto has not been designed to teach a scientific approach to problems, but rather to develop executive skill and foster the spirit of loyalty."

B.H. Liddell Hart (25)

The next step in the development of a theoretical framework for mobility is to look at the relationship between tactical mobility and combat power. The Combat Power Model developed by Colonel Huba Wass de Czege provides an excellent analysis of combat power. It attempts to reach a balance between a purely intuitive assessment of combat power and a totally objective analytical counting of units and weapons. It provides an analytical framework which systematically addresses the components of combat power while providing for subjective evaluations. Additionally, the model recognizes that degradation of the enemy combat power increases the friendly relative combat power.

The Relative Combat Power Model (26)

Lf(Ff+Mf+Pf-De) - Le(Fe+Me+Pe-Df) = The Outcome of Battle

Lf - friendly leadership effect	Le - enemy leadership effect
Ff - friendly firepower effect	Fe - enemy firepower effect
Mf - friendly maneuver effect	Me - enemy maneuver effect
Pf - friendly protection effect	Pe - enemy protection effect
De - enemy degrading of friendly firepower, maneuver and protection effects	Df - friendly degrading of enemy firepower, maneuver and protection effects

Combat power is the property of combat action which influences the outcome of the battle. It is relative to the enemy and is never absolute. Additionally, it is meaningful only at the time and place where the outcome of the battle is decided. In order to relate tactical mobility to combat power, it is necessary to examine the element of combat which is influenced by it.

Maneuver is the element of combat power which is influenced by tactical mobility. In this model, maneuver effect is a function of unit mobility; tactical analysis; management of resources; and command, control, and communications. Although for our study unit mobility is the focus, the other factors of maneuver effect influence the ability to maximize the mobility capability of a weapon system or unit. Often the physical capability of a weapon system is viewed as defining the finite extent of maneuver. That is, the speed, range, and cross country capability are viewed as setting the limits of its tactical mobility. However, the other maneuver effect factors influence the effectiveness of tactical mobility. It is necessary to examine these factors in order to determine the relationship of tactical mobility to maneuver effect.

As already noted, they are:

- Tactical analysis
- Management of resources
- Command, control, communications , and intelligence (C3I) (27)

Tactical analysis insures that a unit moves to the right location prepared for the correct action. In regards to maneuver, the staff and commander must understand both their unit's mobility capabilities and the enemy unit's capability. Understanding the effects of terrain and weather on both friendly and enemy units is critical to an accurate analysis.

Understanding the enemy through the intelligence preparation of the battlefield (IPB) is necessary to avoid assigning missions beyond the capability of a unit or which do not utilize all of a unit's capabilities.

Another consideration for maneuver effect is management of resources. Movement of a unit on the battlefield requires efficient resource management to maximize the maneuver effect. This includes the effective use of equipment, supplies, personnel, time, and energy of subordinates. The model shows equipment management as proper use of an item for a particular mission. Use of supplies is managed through provisions for distribution, conservation, resupply, and accounting. Use of personnel is managed by job skill matching, distribution planning, accounting, cross training, and replacement procedures. Use of time is managed by prioritization of tasks, integration of tasks, and supervision of performance. Finally, use of subordinates' energy is managed by understanding and use of surge capability with consideration for subordinates' physical and mental fatigue.(28)

The last consideration for maneuver effect before looking at mobility is C3I. It is impacted by span of control, SOPs and doctrine, staff efficiency, and adequate communications. Span of control is influenced by the number of subordinate units, task organization, and the number of situation variables. The effective use of SOPs and doctrine depends on their quality and on proper application. Staff efficiency is a function of organization and training. Finally, adequate communication is a function of systems design and proper employment.

The Combat Power model suggests an interdepence of all the factors in determining the maneuver effect. While tactical analysis, management of resources, and C3I are all distinct elements of the maneuver effect, their

influence on tactical mobility is a major portion of their effect on maneuver. The effects created by maneuver contribute to combat power. The model says that unit mobility at the tactical level is dependent on:

- Physical fitness and health of individuals
- Unit teamwork and espirit
- Unit equipment capabilities
- Unit equipment maintenance
- Unit mobility skills (29)

With an understanding from the combat power model that maneuver effect depends on much more than just mobility, it is necessary to explain those considerations which effect mobility in the model. The first is physical stamina. Physical stamina requires soldiers who are physically fit and healthy. Unit team work and espirit requires high morale and group cohesion. Equipment capability is determined by design characteristics and supply of fuel. Equipment maintenance depends on preventive and corrective actions. Finally, mobility skills of the unit depend on its ability to road march and navigate.

The combat power model shows the relationship of mobility to maneuver. The physical capability for tactical mobility is only a small part of maneuver effect. Tactical mobility depends not only on the capability of equipment but also the how well it is utilized. The training of the soldiers will determine the effectiveness of a unit's tactical mobility. Additionally, the doctrine used by the force influences the effectiveness of tactical mobility. The model adds the human dimension in development of the theoretical framework for tactical mobility.

IV. The Theoretical Framework of Tactical Mobility.

"Freedom of movement gives harmony of offensive and defensive power."
J.F.C. Fuller (30)

The theoretical framework of tactical mobility includes the relationship between increased lethality driving the need for dispersion to survive and the need for mobility in order to mass forces. As the historical development from the Civil War to the present shows there has been an expanding dispersion on the battlefield as the lethality of weapons increases. The massing of forces presents targets which increased firepower can destroy more efficiently. A dichotomy exists. There is a requirement for concentration for a successful attack and a need for dispersion for survival. Clausewitz writes in a chapter titled "Concentration of Forces in Space" that: "Apart from the effort needed to create military strength, which does not emanate from the general, there is no higher and simpler law of strategy than that of keeping one's forces concentrated."(31) As the battlefields of the western front of World War I proved, massing without tacctical mobility could not overcome increased firepower.

Tactical mobility theoretically requires the ability to not only overcome terrain and weather conditions but provide some form of protection from enemy firepower. The early use of tanks in World War I provided protection; however, the tank lacked the necessary mobility due to mechanical limitations. As the development of the internal combustion engine progressed, the reliability and range of armored vehicles provided both mobility and protection.(32) However, the theoretical framework of tactical mobility is fixed not only on the the ability of combat forces to

move but also the ability to sustain these forces.

Tactical mobility theoretically is tied as much to sustaining a force as to its ability to negotiate a type of terrain. Historically, it is the logistics tail of a mechanized force which dictates the limits of its advance not only at the operational level but also the tactical level.(33) The ability to refuel, repair, and resupply ammunition is a limiting factor which the theoretical framework must consider.

Another consideration for the theoretical framework is the use of man-made obstacles. The defense not only provides use of terrain for protection but the ability to construct obstacles on it so as to reduce the enemy's ability to move. This includes firepower increasing obstacles such as minefields which can directly contribute to the destruction of the enemy and terrain reinforcement such as antitank ditches. The ability to overcome obstacles is an essential part of mobility. It is both equipment and organizationally driven.(34) Some ability to overcome obstacles is designed into equipment and specialized equipment is developed and organized to be available when required.

The theoretical framework of tactical mobility established so far is the relationship between increased lethality driving the need for dispersion to survive and the need for mobility in order to concentrate forces. Historically, a lack of tactical mobility hinders the ability of combat forces to maneuver. The conditions required for mobility are overcoming terrain, both natural and man-made obstacles while providing protection from enemy fires and sustaining the men and equipment. The Combat Power Model previously discussed relates maneuver to combat power with unit mobility as one of the variables of maneuver. Examining the model provides the final part of the theoretical framework of mobility.

The Combat Power Model supports the theoretical framework developed so far. Tactical mobility is not an end unto itself but only a means by which to facilitate maneuver on the battlefield. As the model depicts, unit mobility is dependent on physical stamina, unit teamwork and espirit, equipment capabilities, equipment maintenance, and mobility skills. What the model adds to the theoretical framework is the moral domain. Battles are won by men not machines. Tactical mobility is dependent on not only the capabilities of the equipment but also by how well the equipment is utilized by the soldiers. This depends not only on the training of the individual soldier, but also how the tactics utilize mobility to enhance maneuver. An historical example of this is the Battle of France in 1940. Both the French and Germans had essentially the same ability for mobility of forces.(35) In fact, the Allied Army had a numerical superiority in tanks. However, the German doctrine used mobility to facilitate maneuver and the French did not. "One of the major reasons why these expectations (of how well they would fight) were so dramatically disappointed was that French soldiers were taken completely by surprise by the way in which the enemy used tanks and airplanes together to create a whirlwind of fire, noise, and movement."(36)

Having examined the Wass de Czege's Combat Model and the historical search for mobility to overcome the effects of dispersion, a theoretical framework for mobility has been established. Within the theoretical framework tactical mobility is an intergral part of maneuver and includes the ability to move over terrain with a dependence on protection, counter obstacle measures, and sustainment. And this ability is dependent on both technology and the moral domain. Technology determines the physical limit. The moral domain determines the extent to which the physical limit can be

realized. With this framework established, it is now necessary to look at the future battlefield in relation to tactical mobility.

V. Mobility Requirements on the Future Battlefield.

"Move when it is advantageous and create changes in the situation by dispersal and concentration of forces."

Sun Tzu (37)

The analysis of the theoretical framework determined that as lethality increases dispersion increases. Therefore, it follows with the recent technological explosion in precision guided weapons and target acquisition that dispersion will increase. Linear battle lines cannot disperse sufficiently to overcome the increased lethality and still provide a viable defense. The future battlefield will move toward a nonlinear battlefield.

For clarity it is necessary to explain just what is meant by a nonlinear battlefield. As envisioned in the ALB-F concept both operational and tactical forces will operate in a nonlinear environment.(38) Because of the subject of this paper, only the tactical level is discussed. On a nonlinear battlefield the commander places his forces in dispersed, noncontiguous areas from which to operate to destroy enemy forces. This disposition of forces may be by design to avoid enemy firepower or by necessity because of lack of forces. The emphasis is on destruction of enemy forces rather than terrain retention. On the nonlinear battlefield lines of communication become difficult to define and maintain.

Nonlinear warfare makes great demands on tactical mobility. The maneuver forces must operate over greater depth and width. The enemy will be able to detect and fire at long range. Lines of communications will not be maintained continuously. The enemy will have the ability to introduce dynamic obstacles delivered at long range. Dispersed forces must

synchronize their concentration just prior to assaults. All these conditions will effect tactical mobility on the future battlefield.

Chris Bellamy in The Future of Land Warfare makes the case for future warfare to look like a space age Verdun. Although he feels the battlefield is expanding, he sees that long range indirect fires will create a sort of no man's land similiar to that of World War I. "Within this gigantic battle zone, the manoeuver of armoured brigade and battalions will be like that of trench raiding parties in the Great War, violent, but a tiny part of the overall struggle."(39) In Europe, he foresees that the chemical dimension added to the increased lethality of firepower will force such dispersion in that limited theater that maneuver will be impossible. He does not hold out for a short war of maneuver but a long war of attrition. "Drawing distinctions between 'attrition theory' and 'manoeuver theory' simply obfuscates the real nature of war."(40) While Western Europe has spaced itself out of classic mechanized warfare, he contends that the Middle East, Asia, and Africa are different. These countries still do not have the strategic weapons to make major air-land warfare as impossible as it is for Western Europe or the superpowers. In fact, he predicted major air-land warfare in Asia or North Africa within the next quarter century (His book was written in 1987).

Bellamy obviously had no idea that the Warsaw Pact would crumble a scant three years after he wrote his book. Taking his analysis but removing the large number of forces he foresaw leaves a picture not of modern positional warfare but closer to that of the battlefield used in the ALB-F concept. The ever increasing costs of modern high technology weapons is reducing the size of armies which a government can afford. If the move to smaller technologically superior armies occurs, a nonlinear battlefield is

probable. Smaller armies occuppy less space and therefore may not be able to maintain a continuous front. That huge no man's land, which Bellamy envisioned, may exist as well as spacing between forces which allows room to maneuver.

Another writer who has explored what the future battlefield may hold is Richard Simpkin. In his book Race to the Swift, he sees air mechanization as the battle of the future. He feels that the mobility which the helicopter provides will eventually force it to become the main battle vehicle. "For a main battle air vehicle uses ground tactically without relying on it for mobility."(41) Taking on the argument that helicopters can not hold ground, he contends that the increased intensity of indirect fire makes the holding of ground with a large static ground force impossible. He writes: "Both high-density defenders and those who concentrate unduly to attack them will be pulverised."(42) Simpkin also foresees a shift in the size of armies as the economic burden of equipping and maintaining large mass armed forces. With the "communications-induced acceleration of geopolitical tempo", Simpkin suggests that armies must move toward small, light specialized forces. "... the emphasis is swinging from "standard" infantry via light infantry to the combination of special forces, airborne troops, and helitroops now represented by the Soviet Airborne Forces."(43). Clearly the future battlefield may be much different than that we have been planning to fight in central Europe.

Both authors agreed on the reduced size of future forces and the increased lethality on the future battlefield. The reduced size of forces will be dictated by the constantly increasing cost of technology. Additionally, with the change in relations between the Soviet Union and the United States, the perceived need for large forces has declined in spite of

the current situation in the Persian Gulf. The increased lethality will be due to precision guided weapons and advanced target acquisition systems.

The combination of these effects is expected to characterize future battles as nonlinear. This follows from the theoretical framework developed in section IV of this paper. The lethality expected from "brillant munitions" combined with extremely long range target acquisition and intelligence collection insures that dispersion will continue to increase. Combining this with budget driven reductions in the size of forces leaves much room on the battlefield. Consistent with the theoretical framework tactical mobility will be needed to mass forces to attack.

The theoretical framework developed determined that mobility is an intergral part of maneuver. Movement depends not only on the physical ability of equipment to move over terrain, but also protection, sustainment, and obstacle reduction. Tactical mobility is dependent on both technology and the moral domain. Technology determines the physical limit. The moral domain determines the extent to which the physical limit can be realized. (44) Considering this theoretical framework and the effect of conditions on the future battlefield, this paper will now analyze the requirements for tactical mobility based on the seven battlefield operating systems (BOS).

The first system to consider is command and control. The synchronization needed to concentrate dispersed forces will drive the mobility requirements for command and control. The greatest single effect on maneuver which mobility must overcome on the future battlefield is the ability to cross great distances of terrain in a noncoherent formation but arrive able to concentrate and assault. The great distances that maneuver forces must cover requires a command and control system with mobility superior to the maneuver forces. It must also be highly survivable to insure

coordination of many dispersed, fast moving elements. Failure of the command and control system deep in enemy territory could mean piecemeal destruction of committed maneuver forces. Additionally, flexibity must be insured as our dispersed, fast moving units try to close with forces of equal or near equal mobility. The command and control system will move toward more reliable long range communications pushed lower and lower. However, this will not offset the needed for tactical level commanders to be able to move around the battlefield. "Quite apart from its effect on morale, 'forward command from the rear' cannot work."(45)

The next BOS to consider is the one which is most radically changing the future battlefield. Fire support lethality has the anticipated destructive power to completely alter the future battlefield. Its projected longer ranges and accuracy will increase the need for protection to allow mobility. Protection will take the form not only of ballistic and chemical protection for the soldier, but also avoidance of detection through stealth technology and jamming or deception of guidance systems in smart munitions. The fire support which accompanies the maneuver forces must have equal mobility with the maneuver forces. However, there should be less need for accompanying artillery since the long range fire support systems will be more survivable. The long range fire support systems must have sufficient tactical mobility to provide for their own protection through rapid movement through movement. Additionally, they must be able to displace forward long distances quickly in order to continue an attack at greater depth. Although the main effect of long range fires will be designed for destruction, they will also be used to deliver obstacles which will affect the next BOS to be discussed.(46)

The mobility/countermobiliy/survivability BOS will require the ability

to quickly overcome natural and man- made obstacles. On the future battlefield a maneuver force will be required to quickly overcome an obstacle to avoid long range fires. Additionally, with the increasing necessity for concentration during the assault, a maneuver force's elements must be able to synchronize a simultaneous attack. Therefore, obstacles can not be allowed to slow forces. In the past obstacle has normally been the responsibility of the engineers. On the future battlefield the ability to deliver smart mines from long range will require equipment which can defeat this type of minefield quickly. The key to tactical mobility on the future battlefield may hinge on the technological development of antimine equipment organized organically with the maneuver forces to insure they are not blocked from routes they must take to succeed. The ability to overcome obstacles quickly will be necessary to help avoid detection. Also this ability will be necessary to keep forces from being channelized by terrain. The tactical mobility on the future battlefield will have to overcome both natural and man-made obstacles with greater speed to overcome increases in detection capability and in the effect of long range fires.

There are two approaches to providing vehicles with obstacle breaching capability. Either provide every vehicle with breaching capability or have one specialized system which does it for a group of vehicles. The driving factor is cost efficiency. For example, currently it is more efficient to have bridging equipment than to design tactical vechicles which have adequate swimming capability. As another example, it is more efficient to have dedicated air defense vehicles than have an air defense system on every tactical vehicle. On the future battlefield with reduced numbers of systems moving independently, the trend must be toward vehicles which require little support for their own tactical mobility.(47) Cost and physics must be

balanced as much as possible. However, the dispersed maneuver required on the future battlefield requires each maneuver element to have organic breaching capabilities which should not be jeopardized by loss of a few specialized pieces of equipment. Having used air defense as an example, it is appropriate to examine it next.

The tactical mobility requirements of the air defense BOS will be driven by the necessity to cover much greater areas of responsibility. On the future battlefield much of the long range fires will be from air. However, the development of more standoff capability for air delivery will reduce the effectiveness of point air defense. Therefore, the air defense will be required to be deployed away from but within supporting distance of the maneuver force. On the future battlefield even Air Force fast movers will have to fly nap of the earth to survive. "Soon, if not now, any aircraft which climbs out of the nap of the earth into hostile radar vision within range of hostile surface-to-air or air-to-air will be destroyed."(68) The tactical mobility of the maneuver forces will require air defense protection. Particularly in open terrain, tactical mobility can be negated by enemy air power. A key to helping with air defense in the future will be the increased capability of intelligence, the next BOS to be discussed.

The intelligence BOS requirements for tactical mobility on the future battlefield are the hardest to predict for maneuver units. The current trend for intelligence assets is to draw them to higher echelons. Since the maneuver forces are brigade and lower, they may not have that many organic intelligence assets. Intelligence will be provided by down link from higher echelons often simultaneously transmitted from theater and corps to division and brigade. The ALB-F concept assumes near perfect intelligence. However, the maneuver brigades will not be capable to develop the

intelligence but only use that provided from higher level detection systems. But whereas, the intelligence BOS may be least affected by requirements for tactical mobility on the future battlefield the next BOS is probably the most affected.

The nonlinear battlefield may place the greatest burden on combat service support (CSS). Currently, CSS units do not have the same tactical mobility as maneuver units. CSS units are essentially road bound and generally not totally transportable with organic assets in one lift. Additionally, CSS units have very little self protection. On the nonlinear battlefield tactical mobility for CSS units is required to make the maneuver units self sufficient. As much CSS as possible will have to move with the maneuver units. Because of the long distances which maneuver forces will have to travel as they maneuver for close combat, air resupply will become critical at even the lowest levels far forward. With the increased lethality of air defense systems the cost of air resupply will have to be weighed against development of CSS vehicles which can move with the combat forces.

With the increases in technology, armies have become more dependent on supplies from home. The requirements for fuel and ammunition continue to increase. The paradox seems to be that systems which provide greater tactical mobility also require ever increasing support requirements. With fewer numbers of weapon systems on the battlefield keeping them servicable will be of even greater importance. Therefore, on a nonlinear battlefield with units moving without regard to secure lines of communication the tactical mobility of CSS units will have to keep pace with the combat forces and form a self contained unit. Having looked at requirements for tactical mobility on the future battlefield, the analysis now focuses on the maneuver phase of the ALB-F concept.

VI. Critical Considerations for Tactical Mobility in ALB-F Concept.

"Mobility is the keynote of war."
Napoleon (49)

Having established a theoretical framework for tactical mobility in section IV and examined the tactical mobility requirements on the future battlefield in section V, the base is set to analyze the critical considerations for tactical mobility in phase III of the ALB-F concept. This is the maneuver phase of the ALB-F concept. The criteria for analysis of the tactical mobility requirements of the concept are sufficiency, feasibility, and the time/space continuum.

The ALB-F concept may not provide for sufficient tactical mobility to support the requirements of the maneuver envisioned. The Chief of Staff White Paper, "The United States Army - A Strategic Force for the 1990's and Beyond", discussion on organizational requirements states that future units will be smaller, more mobile and lethal but required to control and influence a larger part of the battlefield.(50) The discussion in that section centers on maneuver forces which are more self-sufficient with combat support and CSS units having mobility commensurate with the forces being supported. However, this is the only place in a 38 page document which addresses this important aspect of tactical mobility. The rest of the paper is devoted to intelligence gathering capabilities and long range fires. Of the nineteen specific technology areas listed which the ALB-F concept will key on, only one relates to increasing tactical mobility. "Some limited number of new improved and enhanced weapon platforms (new armored vehicles, new aircraft) will increase our ability to project and apply our

combat power."(51) The focus is almost exclusively on intelligence capabilities and lethality of long range weapon systems.

Although there is emphasis on tailoring units which could be linked to their tactical mobility, the current equipment available could not provide the tactical mobility required on the nonlinear battlefield. The distance the brigade size ground units travel from a dispersed location to attack is 150 to 200 kilometers. These forces will have to travel dispersed over several routes and mass just prior to attacking the enemy forces. This requires "exquisite" synchronization. Tactical mobility must allow movement which the enemy can not effectively reduce. If the enemy is able to reduce our tactical mobility, then our leave units become targets for the enemy's long range fires. There must be more consideration for the tactical mobility required to do this type of operation. However, the ALB-F concept does not provide the basis for improving the tactical mobility of ground or air maneuver forces sufficiently to expect them to be able to operate as envisioned over such long distances.

The current equipment does not provide for projection of combat power at great depths. The CSS equipment does not have the protection or movement capabilities required to insure the combat vehicles can operate at such long distances. The U. S. Army does not have sufficient obstacle clearing capability to insure quick breaches of remotely delivered smart mines.(52) Unless there is significant increases in the tactical mobility of maneuver forces in the next 15 years, the ALB-F concept will not be a viable option. Advances in technology must not only be applied to fires and intelligence but also tactical mobility. The predictions and possibility for long range fires and intelligence advances are widely believed to be possible. But what of mobility advances?

If the tactical mobility currently available is not sufficient, then the next step is to examine the feasibility of developing a maneuver force with the required mobility. The systems required to provide the tactical mobility necessary in the phase III of the ALB-F concept are not currently fielded or projected. Although the M-1 Abrams tank and M-2 Bradley fighting vehicles have excellent cross country mobility and protection, they require logistic support vehicles which can keep up with them on a nonlinear battlefield. Additionally, bridging and breaching assests do not have the same mobility as these combat vehicles. The technological ability to provide vehicles which can keep up with these combat systems is obviously available. These systems would not have to be nearly as complex as an M-1 or M-2. If current development of helicopter technology is successful, a maneuver force of air main battle vehicles supported by helitroops may prove Richard Simpkin's ideas on air mechanization are correct. The need for overcoming terrain based obstacles would be negated with this type of heliborne force.(53) However, weather may then become the problem that technology must overcome. The ability of technology to provide tactical mobility required of the maneuver in phase III should be available. However, just because the technology exists does not mean it is feasible.

The overriding consideration for all new equipment for the Army in the foreseeable future will be dictated by budgetary constraints. The CSA white paper says, "While we will strive to ensure that our soldiers have every technological advantage, we nonetheless will need to impose appropriate procurement criteria to get the most overall value from our resources."(54) The escalating costs of new technologies and the limited funds available for procurement will be the driving force on whether equipment is available.

The more technically oriented an army is; the more dependent it is on logistics. The increasing cost of highly mechanized and technologically advanced armies is driving them to be smaller. Even a economic power as large as the United States is being forced to continually reduce the size of its military. In a competing budget tactical mobility requirements for ground maneuver forces may not be a priority. Particularly when the driving force behind the ALB-F concept is destruction at long range with maneuver forces used only "if necessary, to complete destruction of enemy forces."(55) With a focus on sensors and fires the maneuver is being made a secondary concern. And secondary concerns may not be able to pass through budgetary constraints. The feasibility of providing the tacical mobility necessary to allow the maneuver envisioned in phase III of the ALB-F concept will depend on priority in budgetary conflicts. However, is the kind of tactical mobility envisioned needed?

The tactical mobility requirements must be considered in terms of the time/space relationship on the future battlefield. The consideration for this relationship can be looked at in terms of the physical, moral, and cybernetic limits. The physical limits are those dictated by the environment, terrain, and equipment. These limits affect the physical means available to accomplish tactical mobility. The moral limits are those dictated by the human requirements for tactical mobility. These limits affect the human effort needed to accomplish tactical mobility. Finally, the cybernetic limits are those dictated by the control system and organization. These limits affect the means available for tactical mobility with regard to control and organization. Examining the time/space relationship in terms of the physical, moral, and cybernetic limits provides a systematic analysis.

The maneuver required in the ALB-F concept is dependent on the

physical limits imposed by the nonlinear battlefield. In order to insure protection through dispersion the maneuver units must move on as many routes and as quickly as possible. For the best results all units must converge to attack the enemy force simultaneously immediately following a strike by long range fires. Additionally, the units should be stationary in the battle area as little as possible both before and after the battle. Therefore, after the battle the unit will probably need to move back out of the battle zone as quickly as possible to reconstitute.

The ALB-F concept envisions a corps controlling brigade size maneuver units. However, the actual routes may be for no more than battalion size units. A movement with three or four brigade size units over easily trafficable terrain without obstacles or fires to hinder them is difficult to coordinate. Add to this the need for strict adherence to a movement calculation designed to get the units to the right place at the right time for a simultaneous attack and the complexity of the mobility requirements is greatly increased. Without the luxury of being able to stop and wait once the force moves into the battle zone the need for undeniable tactical mobility is required. Every time the unit halts it is more vulnerable to enemy long range fires. Obstacle breaching must be rapid and terrain conditions must not slow the movement. The ability to synchronize such an attack requires much more than the physical requirements of tactical mobility. However, to insure the time/space relationship is possible to acheive a simultaneous convergence, the force must have tactical mobility. Currently, only an air assault with helicopters could accomplish this. Mobility of ground maneuver forces would need significant improvement. The operating ranges and ability to sustain also set physical limits which must be overcome if the concept is to be viable.

The consideration of moral limits must be considered. Looking back at the Wass de Czege's combat power model discussed in section 3, the physical fitness and health of individuals, unit team work and espirit, and unit mobility skills all were factors in the unit mobility portion of the maneuver effect. The nonlinear battlefield, with the increased lethality associated with it, will continue to tax the individual soldier's moral limits. The ALB-F concept seeks to increase the tempo even further. The maneuver operations during phase III will be continuous operations conducted quickly and violently in an environment of heighten uncertainty. Operating throughout an unsecure area without followup forces will add to the already stressful conditions of these combat operations. Commanders and individual soldiers must consider the implications of being left behind because of equipment failures or serious wounds in hostile territory.

Finally, the cybernetic limits must be considered in the time/space requirements for tactical mobility. This is one area which the ALB-F concept does address as a specific area which it anticipates increases in technology to significantly assist. However, the concept is contradictory in discussion of the doctrinal implications of the command and control required. On the same page of doctrinal implications are listed: (56)

- C2 must embrace more command and less control in execution of battlefield operations.
- C2 synchronization of the battlefield operating systems requires enhancement.
- Corps has a greater responsibility in execution of combat activities.

These implications seem to be at odds with each other, particularly in relation to the maneuver phase. The greater distances and unsecured lines of communication dictate that there must be sufficient tactical mobility to

allow independent operation. Yet, in order to achieve a significant concentration of combat power at the decisive point the corps must have control so as to synchronize all the dispersed forces and the long range fires.

The "exquisite synchronization" that the concept requires means that the maneuver forces C2 system must be able to control forces and integrate updated intelligence on the move. Because of the distances involved and time required, the planning for an attack on a moving enemy force will have to be done on the move. The system must allow for dissemination to every vehicle and combat support system while enroute. Controlling long range fires and dispersed ground and air maneuver forces at great depths requires positive control and tracking of friendly forces will be the cybernetic limitation of phase III. The advanced technologies must be able to accomplish this task or maneuver forces will be committed piecemeal and long range friendly fires will be as much of a danger as the enemy.

VII. Conclusions and Implications.

"Catchwords . . . are necessary for all those who are unable to think for themselves . . . The following observations have no other object than to stimulate someone . . . to think for himself and, whenever a catchword is uttered, to confront him with the question: Is it true?"

Hans von Seeckt
Commander-in-Chief of the German Army, 1920-26 (57)

The basis for ALB-F concept is consistent with the theoretical framework for tactical mobility established in this paper. The projected increase in lethality is so intense that the dispersion required to overcome it is so great that only nonlinear warfare is possible. However, the revolutionary tactics required to fight a nonlinear war cannot be fought with evolutionary equipment. Once again, as through out history, firepower is increasing faster than the tactical mobility required to overcome it. And the maneuver envisioned in phase III of ALB-F is ahead of the ability of our systems and doctrine to provide the tactical mobility required.

The question is should weapon development and technology drive doctrine, or should doctrine drive the development of required systems. The Concept Based Requirements Systems (CBRS) which the U. S. Army currently uses says develop how we want to fight and then develop the systems to support it. The umbrella concept of ALB-F provides the framework for an entirely different way of fighting and a different focus on weapon systems and tactics. Although we must take advantage of advanced technology in a budget conscience Army, a radical change in doctrine requiring substantial change in the entire ground force structure may not be possible. A slow

transition may be acceptable in peacetime. However, the danger is a partial transition with only a portion of the necessary requirements funded or with the technology not available when the war starts.

The considerations for the tactical mobility required for phase III of the ALB-F concept must not overestimate the ability of ground maneuver forces to conduct nonlinear tactics without an appropriate increase in tactical mobility. This increase will depend not only on the physical capability of the weapons but also those factors which development of the theoretical model demonstrated. The maneuver forces need protection, counterobstacle measures, and sustainment. What the ALB-F concept requires is that the maneuver forces move quickly and without interference so as to travel dispersed and concentrate for an attack. This requires not only combat vehicles with superior tactical mobility but also sustainment capability. Additionally, the ability to avoid or breach obstacles is necessary to insure maneuver forces can synchronize an attack over the long distances envisioned. Finally, the maneuver force must have sufficient protection to allow it to move on the battlefield.

The implication for the ALB-F is that the organization of maneuver units must include CSS vehicles with sufficient tactical mobility to accompany the combat vehicles. The ability to keep the limited number of combat vehicles operational on a nonlinear batlefield is required. The CSS considerations to support increased tactical mobility must include the ability to provide support without secure lines of communications. The concept of self-contained units with sufficient fuel, ammunition, and maintenance support to operate long distances without continuous support is an intregal consideration to support the ALB-F concept.

The next consideration for tactical mobility is the need for obstacle

clearing ability. If a maneuver force does not have the ability to quickly overcome remotely delivered mines or natural obstacles, it will be impossible to insure combat power is applied at the critical place and time. There must be added emphasis to insure that technology is focused on breaching capabilities.

The last consideration is that the protection required to insure tactical mobility is possible. This could be the most glaring inadequacy of the maneuver phase of the ALB-F concept. The idea that our forces can maneuver but the opponents can be destroyed or shaped by our long range fires. If our fires are expected to do this than his fires can be expected to do it also. In order to insure our maneuver forces have tactical mobility, they must have protection from the enemy's fires.

The ALB-F concept is still being developed and as such much more consideration will go into it. However, the considerations for the tactical mobility requirements in phase must be considered carefully. The risk of putting too much emphasis on near perfect intelligent and decisive long range fires may subvert the need for adequate development of the maneuver forces.

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